

Background Information:

Mine Gases



The Earth's atmosphere is made up of a mixture of gases. On the surface of the Earth, the ratio of these gases stays the same. Surface events, such as fires, explosions, volcanic eruptions and even animals and plants breathing, can have an effect on the proportions of these gases in the air. These effects are usually short-lived and will only affect a small area, because unusual gas concentrations are quickly dispersed by wind and air currents.

Coal mines are confined spaces, and abnormal gases do not always have the chance to disperse in the same way. Some gases may build up in the mine, and can cause danger to people working underground.

Blackdamp and Carbon Dioxide

Blackdamp is a mining term for a build-up of carbon dioxide. This gas is not poisonous, but because it replaces oxygen in the air, it means that people have nothing to breathe and can suffocate.

Carbon dioxide can form due to **oxidation**, where coal that is in contact with the air uses up the oxygen to produce carbon dioxide. It is not usually a problem when mine workings are well ventilated. It is heavier than air, so will lie in lower areas of a mine or in old, disused roadways.

Flame safety lamps can detect air that has less oxygen. The flame will go out when oxygen reaches about 16% or less, but people will become affected when oxygen levels reach about 17% or less. Deputies in mines carry flame safety lamps when investigating poorly ventilated workings, and keep a close eye on the flame. They know to move quickly back to a fresh air base if a lamp held low down goes out.



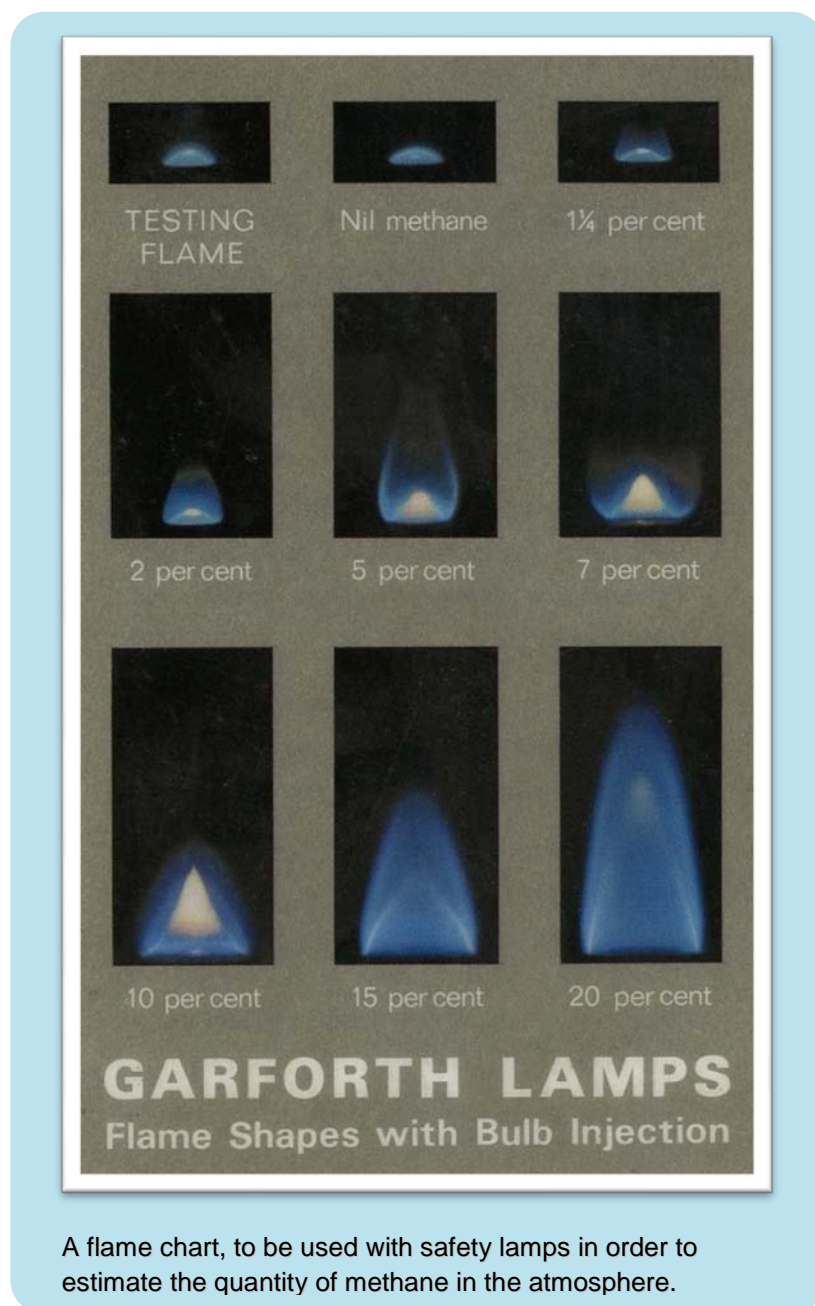
Firedamp and Methane

Methane gas is known as **firedamp** to miners. As this name suggests, methane can burn and in certain conditions can cause explosions. This gas is formed with coal over millions of years. It can be released as coal is mined, when pockets of gas will seep into the pit.

Explosive mixtures of methane can form, and a naked flame, overheated machine, or a spark might then cause an explosion. There are very strict rules about what can be taken underground and about care of working machines.

Methane is colourless and has no smell. When the barometer falls, methane is forced out of the strata, so underground safety may be affected by surface weather conditions. In well ventilated mines, methane should not build up, but it is lighter than air, so will rise into higher points within underground workings.

The flame safety lamp was developed as a safe means of lighting in mines that may have methane. The lamp not only provides light without the risk of an explosion, but can also be used to test for methane. A testing flame in these lamps is very small and shows a triangular blue gas cap if there are high quantities of methane in the air. While these lamps are still used today to test for gas, multi-purpose Solaris detectors are also used.



A flame chart, to be used with safety lamps in order to estimate the quantity of methane in the atmosphere.

Carbon Monoxide

Carbon monoxide is a poisonous gas caused by fires. The gas is colourless and does not smell, so cannot be easily detected by people.

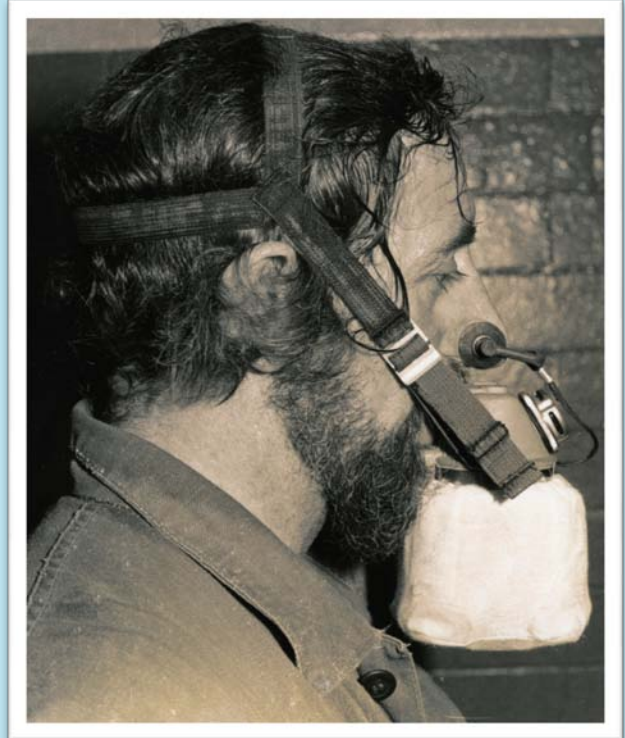
Carbon monoxide affects small animals more quickly than people. Caged canaries were used as a simple way of detecting carbon monoxide. The birds would fall from their perch before the miners were affected, and they could move quickly to an area of fresh air. Canaries affected in this way could often be revived. Modern equipment can detect carbon monoxide and tell miners exactly how much of the gas is present.



Canaries kept at a working pit.

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Because of the risks of carbon monoxide if a fire starts underground, all miners must wear a **self-rescuer**. The self-rescuer is contained in a small metal case carried on miners' belts. After a fire the case is opened to reveal a mouth-piece and breathing apparatus. Within the apparatus are chemicals which turn the poisonous carbon monoxide into carbon dioxide. The self-rescuer lasts for about an hour-and-a-half.



A self-rescuer in its metal case, and one out of the case being worn as a breathing aid.

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Other Gases

Other gases can also form or be found in underground workings. Hydrogen sulphide is a poisonous gas that smells of rotten eggs, which can form when water in the rocks reacts with minerals found underground. Some gases known as nitrogen oxides can also be formed by some of the processes of mining underground; they too have a very strong smell. Neither of these are usually a problem in mine workings that have good ventilation.

further reading

Industrial Training Branch of the National Coal Board, 1981. *Mine Gases* (NCB)

National Coal Mining Museum for England
Caphouse Colliery, New Road, Overton, Wakefield, West Yorkshire, WF4 4RH

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Reg. Charity No.: 517325 VAT Reg. No.: 457 548 314 Reg. Office: Caphouse Colliery
T: 01924 848806 F: 01924 844567 E: info@ncm.org.uk www.ncm.org.uk

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